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Knowledge management systems use and competency development among knowledge workers

The role of socio-technical antecedents in developing autonomous motivation to use

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Abstract

Purpose – The purpose of this research is to investigate how socio-technical factors inherent in organizational practices and knowledge management systems (KMS) lead to the emergence of autonomous motivation to use KMS and which in turn influences actual utilization and competency development as an impact of KMS utilization.

Design/methodology/approach – This research takes a quantitative approach to data collection on the constructs measuring socio-technical factors, autonomous motivation, KMS utilization and competency development. The survey consisted of 306 knowledge workers across different organizations in Malaysia with experience using KMS. The data collected were analysed using structural equation modelling approach with AMOS software.

Findings – The research findings indicate that the existence of innovative norms in organizations and KMS that provide adequate linkages or connections among knowledge workers are significantly and positively related with the development of autonomous motivation towards KMS use. In addition, autonomous motivation to use was found to have substantial influence on KMS usage and moderately influences the development of competency. Finally, the actual utilization of KMS was found to be contributing significantly to competency development among knowledge workers.

Research limitations/implications – Although the approach of this study is aimed at generalization of results with the combination of responses from individuals working in different organizational settings, few limitations may still affect the scope of the study. First, only an innovative norm is considered as an organizational factor in this research, other constructs such as collaboration and structure are important factors which can be explored in a future study. Secondly, the study is limited to a single country; future studies may include knowledge workers from different countries with exposure to different cultures.

Practical implications – The research offers recommendations and suggestions to managers and top management on the organizational practices and KMS design that can make knowledge workers volitionally utilize the KM systems as well as how the impact of implemented KMS on knowledge workers can be measured.

Originality/value – The conceptualization of autonomous motivation to use KMS and the factors contributing to it, as well as identification of competency development as a benefit of KMS use, represent an innovation in the theoretical perspective.

Keywords Knowledge management system, Autonomous motivation, Competency development, Innovative cultural value, KMS characteristics

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1. Introduction

Implementing knowledge management systems (KMSs) as enablers of knowledge management (KM) practices in organizations is ubiquitous because of the belief that KMS facilitates proper keeping of organizations' lessons learned, experiences and expertise of employees as well as the diffusion of knowledge (Lin and Huang, 2008; Rao and Osei-Bryson, 2007; Sherif *et al.*, 2006). While these claims and other benefits are prevalent in some organizations, many other organizations have been unable to justify their investment in KMS (Nantapanuwat *et al.*, 2010). According to Malhotra (2005), industry data suggests a failure rate of about 70 percent of KMS technologies implementation.

Consequently, researchers have asserted that more empirical investigations transcending beyond implementation processes are required (Quaddus and Xu, 2005). Recently, Lai *et al.*(2009) highlighted that very few studies have attempted to empirically investigate the critical factors contributing to the post implementation of KMS. While literature review indicates that technical factors (mainly system and knowledge qualities) contributing to KMS success have gained much attention from researchers (Halawi *et al.*, 2008; Wu and Wang, 2006; Jennex and Olfman, 2002), studies exploring the combined effects of social and technical factor are quite few. Although the technical factors are important, the social factors have been described as complimentary factors necessary for a successful and sustained KMS utilization (Hong *et al.*, 2011; Ciganek *et al.*, 2008).

In addition, the willingness of users in utilizing organization systems has been stated to be an important concern (Malhotra *et al.*, 2008). With respect to KMS, few studies have given attention to this construct. Long ago, Strassmann (1997) asserted that having computers for organizational operations is not what matters, rather it is what people do with the computers. He further stressed the importance of user's motivation and commitment in systems' usage effectiveness. He *et al.* (2009) also assert that the availability of KMS in organizations guarantees not its utilization by employees. Therefore, this study hopes to thread the socio-technical approach that explores the influences of innovative value/norm (organizational cultural value) and KMS characteristics (technical factors) as predictors and KMS user's autonomous motivation (user factor) as mediator of KMS utilization. As mentioned by Ciganek *et al.* (2008), "the engagement of KMS for knowledge activities involves intricate acts that should be based on both technical and social factors just like the management of knowledge itself".

Lastly, the study explores the impact of KMS utilization on intellectual capital improvement by relating the influence of both autonomous-motivation to use and KMS usage to competency development among knowledge workers.

2. Literature review and hypotheses

KMS provides the fast means to gather, link and disseminate knowledge in organizations, but its success depends on the willingness of those (knowledge seeker and contributors) engaging it to perform knowledge processes. As a result, an organic process that naturally motivates users and enables KMS usage for organizational functions is thought to be important. An important motivator for employee's positive dispositions to organizational knowledge processes is the knowledge culture. When KMS is engaged as a medium for KM practices, culture still remains an important

driver for its effectiveness. Coupled with culture, the systems are expected to possess technical functionalities that make its utilization worthwhile. It is believed that when these factors are in place, users will have a natural will to make use of the systems rather than a forced or compliant usage.

Although, literature unveils that cultural influence on KM and KMS have been studied recently (Ciganek *et al.*, 2008; Singh and Sharma, 2011; Al-Busaidi *et al.*, 2010), the influence of cultural values on the behavioral disposition of organization members toward the utilization of KMS still leave gaps to be filled. In addition, established KMS attributes that have been investigated by researchers (Halawi *et al.*, 2008; Wu and Wang, 2006; Jennex and Olfman, 2002) have produced mixed results. By establishing links between these factors and KMS usage; where users autonomous motivation becomes a mediator, this study may help to unravel some of the approaches leading to effective and sustained utilization of KM systems. Therefore, earlier works by Schein (1985) and Alavi *et al.* (2005–2006) provide the lens through which the presence of innovative cultural value/norm in organizations is viewed. KMS characteristics factors are explored based on the work of Wu and Wang (2006) which respecified the information systems success (ISS) factors by DeLone and Mclean (1992, 2003) for KMS. Furthermore, works by Malhotra *et al.* (2008), Ryan and Deci (2000), and Meyer *et al.* (2004) provide the guide for exploring autonomous motivation with respect to KMS.

In addition, justifying benefits accrued from KMS utilization has been mentioned to be important (Nevo and Chan, 2007). Despite the high rate of KMS diffusion across organizations (Malhotra, 2005), evidence supporting the realization of benefits in KM practices from KMS implementations is hard to prove (Sherif *et al.*, 2006; Braganza *et al.*, 2009). Moreover, measuring KMS success is said to be lacking sufficient validated instruments (Wu and Wang, 2006); therefore competency development among KMS users is proposed in this study as a factor to assess the impact of KMS use. Competency development involves the broadening of employees' knowledge via the exchange of knowledge with colleagues. Lee and Choi (2003) used the terms T-Shaped skill to represent the depth and span of employees' knowledge in their organization's knowledge domain. Similar to T-Shaped skill, Sherif *et al.* (2006) described "the shared meaning and understanding" emanating from the interaction taking place among employees in an organization as cognitive capital. To improve the competency or cognitive capital among personnel in work places, different knowledge domains must be made visible across organizational units. Technology may provide the means to do this by facilitating the organization of codified knowledge in ways that make knowledge seekers easily assess structured knowledge. Similarly, the enablement of collaboration irrespective of the difference in time or space is an advantage which technology can offer knowledge community to integrate and broaden the competency or cognitive capital of every member of the community. Figure 1 represents the theoretical framework depicting the causal relationships among the variables of the study.

2.1 Linking system quality to autonomous motivation to use

System quality implies the ease, speed of completeness and effectiveness in the performance of knowledge functions using the KMS. KMS will aid knowledge sharing positively when it enables faster and easy codification of knowledge (Alavi and Leidner, 2001), provides easy and fast assess to experts, allows for collaboration and

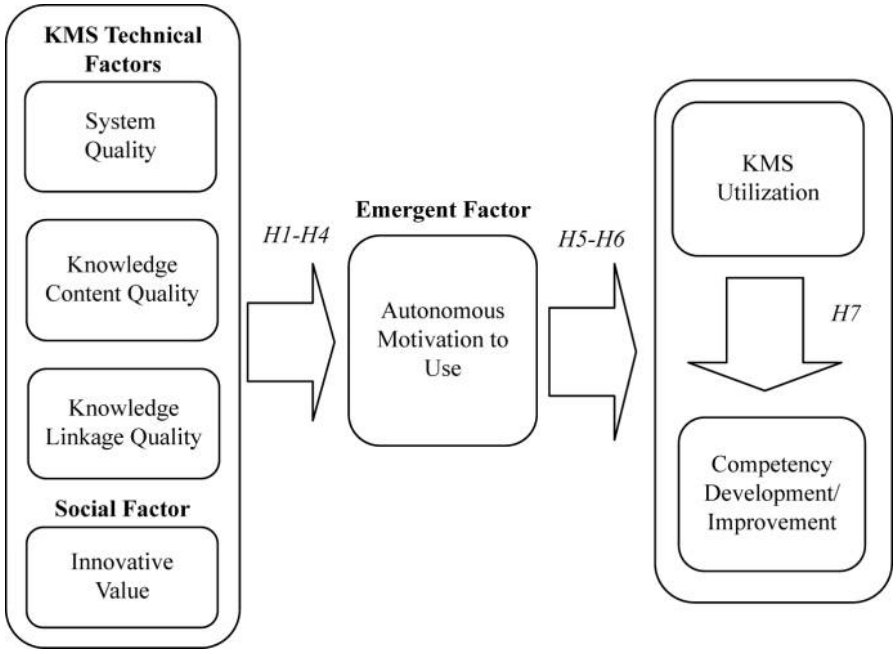

Figure 1.
Research framework

facilitates the visualization as well as the development of relational base of organizations social systems (Huysman and Wulf, 2005). Empirical studies have shown that system quality is an important factor in KMS utilization. In a study that investigates what motivates people to share knowledge to a KMS, Al-Busaidi *et al.*(2010) found that system quality significantly influences how KMS is used for sharing codified knowledge. In another empirical study, Wu and Wang (2006) found that system quality exhibit significant relationship with perceived user satisfaction, which in turn influences KMS use. In another study, autonomous (endogenous) motivation was found by Malhotra *et al.*(2008) to be of positive relationships with perceive ease of use of IT systems. Based on these earlier empirical investigations, it is believed that system quality could motivate or discourage the use of KMS. When technologies meet personal expectations of users, deep motivation is expected to be developed. Therefore, it is conceptualized that KM systems known for their ease of use, speed and user friendliness will influence the development of autonomous motivation towards the use of the systems. Thus, the following hypothesis is formulated.

H1. The degree of system quality in KMS will be positively related with the development of autonomous motivation to use the systems.

2.2 Linking knowledge content quality to autonomous motivation to use

One aspect of knowledge quality of KMS is the richness of its content (Jennex and Olfman, 2003). In the traditional IS success measure, Delone and Mclean (1992, 2003) have used information quality as one of the technological factors necessary for system

success. Information quality focuses on information accuracy, timeliness, completeness, relevance, and consistency. In the case of KMS, the distinction between knowledge and information is subject to the context and the user (Wu and Wang, 2006). What constitutes knowledge to someone can be another's information. For example, codified knowledge stored in a repository without the provision for its context may have its values reduced to the level of information when viewed by an unfamiliar knowledge seeker. However, the contributors of the codified knowledge or those familiar with its context may find it to be a useful knowledge in taking decisions. In their study, Wu and Wang (2006) found that knowledge or information quality of KMS has high effect on perceived KMS benefits, user satisfaction, and system use. Similarly, Nantapanuwat *et al.*(2010) empirical study on the use of KMS in Thai banking sector confirms positive relationship between knowledge quality of KMS and its use. Therefore, to ensure sustained utilization; autonomous motivation becomes very important as it is hinged on self-appreciated values either from extrinsic or intrinsic sources. When knowledge stored in KMS provides sufficient details describing its content and context and can be applied easily to solve job problems or take decisions, individuals are likely to identify personally appreciated values in such systems and be autonomously motivated towards using the systems. Thus it is hypothesized that:

H2. The degree of knowledge content quality in KMS will significantly influence the development of autonomous motivation towards the use of the systems.

2.3 Linking KMS linkage quality to autonomous motivation to use

The major difference in KMS compared to traditional information systems is that KMS has an additional capability to enable virtual networks and knowledge maps among individuals. For example, KMS can make knowledge experts visible via their profiles and it can also enables synchronous and asynchronous collaboration and communication among individuals (Wu and Wang, 2006; Benbya, 2008). Although Wu and Wang (2006) as well as Jennex and Olfman (2003) made differentiation between knowledge content quality and linkage quality of KMS, no empirical study has been conducted to explore the constructs as separate measures in KMS success investigations. Some earlier studies had found significant influence of knowledge quality in their proposed KMS framework (Nantapanuwat *et al.*, 2010; Wu and Wang, 2006). A study conducted by Sherif *et al.* (2006) found that knowledge network (K-NET) provided by KMS facilitates rigorous communications, building of relationships and sense of belonging among knowledge workers. When KMS enables adequate identification and collaboration with knowledge experts, individuals willing to improve their competence and those willing to be recognized as experts are expected to willingly utilize the systems. Against this background, it is hypothesized that:

H3. The degree of linkage quality of KMS will be significantly related with the development of autonomous motivation to use the systems.

2.4 Linking organizational innovative value/norm to autonomous motivation to use

It has been argued that human behavior towards the utilization of KMS for knowledge processes requires appropriate culture as a source of motivation (Ciganek *et al.*, 2008). Cultural value for innovativeness has been identified as an organizational cultural

attribute that functions as socio-psychological motivational driver; with the potential of influencing behavioral disposition towards knowledge practices (Bock *et al.*, 2005). Innovative value or norm allows for practical manifestation of the desire to attain competency. It is a norm that allows individuals to explore and use personal judgement (autonomy) to address organizational issues (Massa and Testa, 2009). Hsu (2008) found innovative strategy as an important predictor of organizational attempts towards effective knowledge sharing practices. Based on an in-depth interview, Massa and Testa (2009) found knowledge domain and innovative behavior as main contingencies impacting KMS. In another interview based study conducted by Alavi *et al.* (2005–2006), value for innovativeness was found to be a motivating factor encouraging knowledge worker's to autonomously engage KMS for knowledge activities. Recently, Lopez-Nicolas and Merono-Cerdan (2009) confirmed in a study across several organizations in Spain that adhocracy culture which emphasizes on innovativeness and creativity is positively influential on the utilization of technologies for knowledge management. Base on these findings, the following hypothesis is formulated:

H4. The existence of innovative cultural value in an organization will be positively related with the development of autonomous motivation to use KMS by knowledge workers.

2.5 Autonomous motivation to use, KMS utilization and competency development

According to Ryan and Deci (2000), individuals' interest to fulfil their inner psychological needs is the main motivating factor accounting for their behavioral dispositions. Usage of KMS as tools in managing organizational knowledge has been mentioned to be dependent on the behavioral disposition of employees to such systems (Malhotra *et al.*, 2008). According to Malhotra and Galletta (2003), a construct yet to be given adequate attention in the implementation of KMS is the users' motivation towards the systems. Self-determination theory (SDT) (Deci and Ryan, 1975, cited in Ryan and Deci, 2000) had it that the need for autonomy, competence and relatedness are the main psychological drive for eagerness in humans. Based on these factors, SDT through organismic integration theory (OIT) elucidates that motivation goes through continuum stages starting from motivation development to its sustenance.

According to OIT, different levels described as follows are represented in the motivation continuum: amotivation, external, introjected, identified, integrated and intrinsic motivations. While amotivation represents the total absence of motivation, SDT explains that motivation involves the intention to behave in certain ways and such intention can be initiated by external source or internally (self) developed (Meyer *et al.*, 2004; Hung *et al.*, 2011). Therefore, it is emergent in nature. Externally induced behavior can be temporal when the resulting motivation does not transcend beyond being external or introjected. On the other hand, externally induced behavior can be permanent when the resulting motivation becomes identified and integrated based on satisfaction of psychological needs arising from such external inducement. Therefore, autonomous motivation is comprised of emergent motivations that can be said to be identified and integrated as well as the intrinsic motivation (Malhotra *et al.*, 2008). Externally induced behavior can become identified and integrated when individuals assimilated such behavior as personal norms because of the perceived benefits (mainly as a means of self-development) attributed to such behavior. Therefore, beyond

delineating between extrinsic and intrinsic motivations; which is the main focus in most KM studies, this study is of the opinion that autonomous or self-valued motivation will play significant influence on the actual utilization of technology for KM processes and the development of competency among individuals. Against this background, the following hypotheses are formulated

H5. The degree of autonomous motivation to use KMS among knowledge workers will be significantly related with the actual use of KMS.

H6. The degree of autonomous motivation to use KMS among knowledge workers will be significantly related with their development of competency.

2.6 KMS utilization and competency development

The IS success model postulated by DeLone and McLean (1992) sets the stage for the prominence attributed to utilization measure by IS researchers (Ali and Money, 2005). As KMS success studies can be said to have evolved from IS theories, KMS utilization (usage) have also become an important or core construct of KMS studies (Nantapanuwat *et al.*, 2010; Halawi *et al.*, 2008; Wu and Wang, 2006; Maier, 2002). But the utilization of KMS, unlike information systems which mainly transfers documents electronically in organization; can be described as processes involving the exchange of documented knowledge electronically, enabling the diffusion of tacit knowledge across organization and linking knowledge seekers with knowledge donors (Wu and Wang, 2006). Consequently, KMS facilitates the creation of organization memory, knowledge maps and community of practices (Ciganek *et al.*, 2008; Al-Busaidi *et al.*, 2010; Alavi *et al.*, 2005–2006; Tong and Mitra, 2008). Therefore, with effective utilizations of KMS in place, individuals engaging the systems to assess stored knowledge, communicate and collaborate with other are expected to develop and expand their cognitive capital and skills.

Thus:

H7. The utilization of KMS will positively influence the development of competencies among users of the systems.

3. Methods

3.1 Sampling and data collection

Prior investigations like the works of Zailani *et al.* (2006) and Tabrizi *et al.* (2011) reveals that KM technologies are widely implemented across organizations including public, private, local and multi-national firms in Malaysia; therefore, executive MBA students established to be personnel of these diverse organizations constitute the population through which samples of this study were drawn. Four institutions ranked as having the best four business schools in the country according to eduniversal ranking of Malaysian business schools in 2010, and which when combined have about 70 percent of the entire executive MBA student population across the country as at the time of data collection were used for sampling. The reason for this high concentration of students in the four institutions when compared to others may be attributed to the locations of the four institutions which are in the vicinities of the two main economic cities (Kuala Lumpur and Penang) in Malaysia. To ensure that different organizational sectors are included in the study, information regarding place of work were sought from the potential respondents through their respective business schools and based on

these prior information, respondents were stratified according to the organizational sectors and a random sample of respondents were conducted on each stratum. In an attempt to avoid invalid responses, potential respondents who were sampled from the study population were e-mailed to seek their consent and to ascertain their KMS usage experiences. Those without experience using the systems were eliminated from the sample and further samplings were conducted to meet the required sample size. Prior to conducting the actual study, a pre-test of the questionnaire was carried out to evaluate the degree of difficulty involved in understanding the questionnaire and this led to adjustments of some of the items. In addition, the reliability of the instruments used was confirmed through a pilot test involving 39 responses. A total sample of 600 respondents with KMS usage experiences were finally selected from the executive MBA students of the four institutions and were subsequently administered the research questionnaire. Of the 600 questionnaires distributed, a total of 311 questionnaires were finally returned, but with five of the questionnaires being incomplete. Thus a total of 306 responses representing 51 percent of the sample were used for further analyses.

The respondents profiles are analysed as follows: majority of the respondents are female 63.9 percent. 54.6 percent have an average work experience of 5 years, followed by 25.5 percent with work experiences ranging between 6 and 10 years and 13.4 percent with work experience ranging between 11 and 15 years. The job positions of the respondents show a good mix with senior managers constituting 9.5 percent, middle managers making up of 27.5 percent, and supervisors constitute 32.4 percent. The clerical executives made up 12.1 percent and technical executives constitute 18.6 percent of the respondents. 17 percent of the responses were from respondents working in service industries, then software or IT industry 15.7 percent, then manufacturing 15.4 percent, then banking and finance 14.7 percent and education sectors 14.7 percent. Majority of the respondents 39.2 percent work in organizations with more than 500 employees; followed by 37.9 percent who work in organizations with at most 100 employees, while 22.9 percent work in organizations with employee number ranging between 100 and 500.

3.2 Measures

In order to operationalize the constructs used in the study, items used in previous studies were adapted and reworded to suit the KMS utilization context. Multiple items were used to measure all constructs with a seven point Likert scale ranging from 1 = strongly disagree and 7 = strongly agree. A four-item scale measuring system quality was adopted from Wu and Wang (2006). These items explore the system's ease of use, user friendliness, stability and fastness in response to queries. Three-item scale adapted from Wu and Wang (2006) was used as measure for knowledge richness quality. These items look into ease of understanding of knowledge, availability of contextual knowledge that makes knowledge content easy to apply and the accuracy as well as up-to-date of knowledge content with respect to organizations tasks. Another three-item scale from the same source was used to measure linkage quality of KMS. The items ask about KMS support for collaborative work space, communication among employees and provision of knowledge maps of experts. A three-item scale measuring innovativeness was adopted from Bock *et al.* (2005). These items focused on the encouragement of innovative practice and risk taking propensity in organizations.

Five-item scale used for measuring autonomous motivation gauged both the valued extrinsic reasons and intrinsic reasons that encourage the use of KMS and were adapted from Malhotra *et al.* (2008). Furthermore, four-item scale adapted from Wu and Wang (2006) was used to measure KMS use. The items focus on the use of KMS for explicit and tacit knowledge sharing. Lastly, competency development measure utilized four-item scale adapted from Lee and Choi (2003). These items focused on KMS support for employees' development of core competencies in their area of specialization and other knowledge domains. All the scales of the study are listed in Table I.

3.3 Data analysis and results

Structural equation modeling (SEM) approach was used in the analysis process of the study. SEM provides the means to simultaneously examine the structure of interrelationships among constructs in a way similar to multiple regression equations (Hair *et al.*, 2006). SEM analysis can be carried out in two stages:

(1) the confirmatory factor analysis (CFA) which assesses the measurement model; and

(2) the structural model assessment as recommended by Anderson and Gerbing (1988).

3.3.1 Measurement model assessment. As a prerequisite to the assessment of the study's structural model, ensuring that the measurement model is adequate is important. Thus CFA was first conducted to test the fitness of the measurement model. The choice of CFA is based on the fact that constructs of the study are theory based and CFA is considered most appropriate for models with established theory. In conducting the CFA, all indicators were modeled to their respective constructs and all construct were allowed to co-vary irrespective of whether they are exogenous or endogenous.

The goodness-of-fit indices used for the measurement model fitting included comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square residual (RMR) and root mean square error of approximation (RMSEA) (Hair *et al.*, 2006). The fit indices of the measurement model ($\chi 2/df = 2.839$, RMR = 0.061, CFI = 0.916, TLI = 0.902, RMSEA = 0.078) indicated an adequate fit of the model to the data based on the acceptable cut off values of $\chi 2/df$ less that 3, RMR less than 0.11, CFI with value close to or exceeding 0.90, above 0.90 for TLI, RMSEA between 0.05 and 0.08 (Bentler, 1990; Browne and Cudek, 1993).

According to Farrell and Rudd (2009), "when conducting CFA, one should never be governed by the fit indices alone"; but the construct validity should also be verified. Therefore in assessing the measurement model, both convergent and discriminant validity were calculated. Convergent validity was assessed by calculating the variance extracted (VE) for each construct from their respective indicators' loadings. As shown in Table I, VE for all the constructs and the standardized factor loading of their items satisfied the cut-off criteria of 0.5 (Hair *et al.*, 2006). The composite reliability as shown in Table I also depicts values satisfying the cut-off value of 0.7 (Nunnally, 1978).

Discriminant validity was assessed by comparing the shared variance (squared correlation) between every pair of constructs (measures/variables) against the VE for both constructs in a pair (Fornell and Larcker, 1981). Except for constructs measuring autonomous motivation to use and KMS utilization, the results in Table II confirmed

Measures	Standardized item loadings	Average variance extracted	Composite reliability
System quality		0.70	0.90
KMS is easy to use	0.88		
KMS is user friendly	0.90		
KMS is stable	0.78		
The response time of the KMS is acceptable	0.77		
Knowledge content quality		0.73	0.88
Knowledge in the KMS is easy to understand	0.86		
The KMS provides contextual knowledge that makes knowledge content easy to apply	0.91		
Knowledge in KMS is accurate and up to date to complete work-related tasks	0.78		
Linkage quality		0.69	0.88
The KMS supports collaborative works regardless of time and place	0.83		
The KMS supports communication among organization members	0.89		
The KMS provides helpful directory (link, yellow pages) to experts which can be contacted when needed	0.80		
Innovative norm		0.51	0.75
My organization encourages the suggestion of ideas for new opportunities	0.79		
My organization put much value on taking risks even if it turns out to be a failure	0.62		
My organization encourages finding new methods to perform a task	0.72		
Autonomous motivation to use			
I use the KMS in my organization…		0.68	0.91
Because I think it's personally important to myself	0.74		
Because it makes knowledge activities more interesting, easier and faster	0.86		
Because I find it helpful for my career and knowledge development	0.86		
Because it makes me explore and learn more about the technologies	0.87		
Because I enjoy using the technologies	0.78		
KMS utilization			
I use the KMS to …		0.70	0.90
Help me make decisions	0.74		
Record my knowledge and search for others knowledge	0.84		
Communicate knowledge and information with colleagues	0.89		
Collaborate with colleagues	0.87		
Competency development/improvement			
KMS contribute to members of this organization ability to …		0.66	0.87
Understand not only their own tasks but also others' tasks	0.81		
Be knowledgeable and make suggestions about others tasks	0.82		
Develop competency in their specific areas	0.83		
Be able to perform their own task effectively	0.80		

Table I.
Scales and convergent validity

Table II.
Discriminant validity

A		B	Correlation (r)	r^2	VE (A)	VE (B)
Innovative norm	⇔	Knowledge content quality	0.482	0.232	0.51	0.73
Innovative norm	⇔	Linkage quality	0.417	0.174	0.51	0.69
Innovative norm	⇔	System quality	0.365	0.133	0.51	0.70
Innovative norm	⇔	Autonomous motivation to use	0.386	0.149	0.51	0.68
Innovative norm	⇔	KMS utilization	0.432	0.187	0.51	0.70
Innovative norm	⇔	Competency development/improvement	0.360	0.130	0.51	0.66
Knowledge content quality	⇔	Linkage quality	0.803	0.645	0.73	0.69
Knowledge content quality	⇔	System quality	0.808	0.653	0.73	0.70
Knowledge content quality	⇔	Autonomous motivation to use	0.551	0.304	0.73	0.68
Knowledge content quality	⇔	KMS utilization	0.538	0.289	0.73	0.70
Knowledge content quality	⇔	Competency development/improvement	0.529	0.280	0.73	0.66
Linkage quality	⇔	System quality	0.787	0.619	0.69	0.70
Linkage quality	⇔	Autonomous motivation to use	0.621	0.386	0.69	0.68
Linkage quality	⇔	KMS utilization	0.614	0.377	0.69	0.70
Linkage quality	⇔	Competency development/improvement	0.619	0.383	0.69	0.66
System quality	⇔	Autonomous motivation to use	0.565	0.319	0.70	0.68
System quality	⇔	KMS utilization	0.575	0.331	0.70	0.70
System quality	⇔	Competency development/improvement	0.590	0.348	0.70	0.66
Autonomous motivation to use	⇔	KMS utilization	0.836	0.699	0.68	0.70
Autonomous motivation to use	⇔	Competency development/improvement	0.677	0.458	0.68	0.66
KMS utilization	⇔	Competency development/improvement	0.698	0.487	0.70	0.66

Notes: A = constructs in column 1 and B = construct under in column 3; A ⇔ B stands for pair of correlating constructs A and B; VE(A) = Variance extracted for construct A; VE(B) = Variance extracted for construct B; r^2 = shared variance between A and B

the discriminant validity as the shared variance of any pair of constructs was less compared to VE of the corresponding constructs. Further collinearity test between autonomous motivation to use and KMS utilization reveals that both tolerance and variable inflation factor (VIF) between the two constructs stood at 1. The rule of thumb according to Hair *et al.* (2006) is a threshold of 0.10 and 10 respectively for tolerance and VIF. Since the tolerance is far greater than 0.10 and the VIF is far less than 10, the two constructs are deemed to be measuring different concepts and satisfy the variable discriminant condition for further analysis. In addition, the assessment of correlations among the variables with results which could be described as ranging from low to moderate and all being significant at the 0.01 level confirm the existence of theoretically based relationships (nomological validity) (Hair *et al.*, 2006) among the variables of the research model.

3.3.2 Structural model. Having achieved an adequate measurement model, the structural path depicting relationships among variables were examined. The fit indices of the structural model ($\chi 2/\text{df} = 2.894$, RMR = 0.083, CFI = 0.912, TLI = 0.899, RMSEA = 0.079) indicates an acceptable model fit with the data. A review of the modification indices (MIs) for the regression weights revealed a relatively large score for two parameters – regression weight of system quality on KMS utilization as well as regression weight of linkage quality on competency development. It is expected that adding the two paths between each pair of latent constructs will minimize the chi-square value of the model and consequently improve the fit indices of the proposed structural model. Thus, the fit indices of the modified model ($\chi^2/\text{df} = 2.812$, RMR = 0.063, CFI = 0.916, TLI = 0.904, RMSEA = 0.077) indicates an adequate model fit to the data. Figure 1 depicts the final results of the measurement and structural models. Table III present the significance path of each hypothesized association and the two added paths.

An examination of the path significance of the hypothesized relationships and the variance explained (R^2) by each path was carried out. As shown in Table III above, all hypotheses except *H2* were supported. Figure 2 depicts the result of the path coefficient. As presented, system quality ($\beta = 0.18$, t-value = 1.69), linkage quality ($\beta = 0.43$, t-value = 3.75) and the existence of innovative norm ($\beta = 0.16$,

Hypothesis	β	T	p	Remark
H1: System quality → autonomous motivation	0.18	1.69	$p < 0.10$	Supported
H2: Knowledge content quality → autonomous motivation	−0.02	−0.16		Not supported
H3: Linkage quality → autonomous motivation	0.43	3.75	$p < 0.001$	Supported
H4: Innovative norm → autonomous motivation	0.16	2.45	$p < 0.05$	Supported
H5: Autonomous motivation → KMS utilization	0.75	10.20	$p < 0.001$	Supported
H6: Autonomous motivation → competency development	0.20	1.89	$p < 0.10$	Supported
H7: KMS utilization → competency development	0.36	3.50	$p < 0.001$	Supported
H8: System quality → KMS utilization (added path)	0.15	3.08	$p < 0.01$	Supported
H9: Linkage quality → competency development (added path)	0.28	4.35	$p < 0.001$	Supported

Note: β is the estimated standardized path coefficients

Table III.
Model testing results

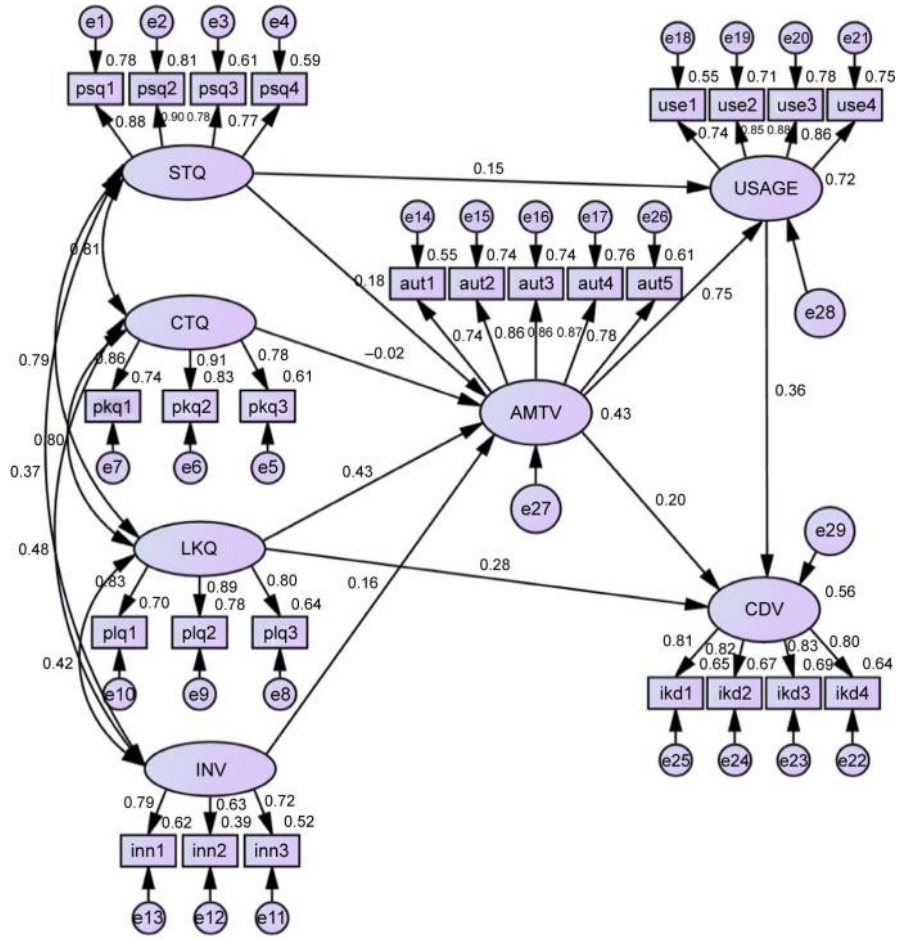

Figure 2.
Structural equation modeling output

Notes: STQ = System Quality; CTQ = Knowledge Content Quality; LKQ = KMS Linkage Quality; INV = Innovative value/norm; AMTV = Autonomous Motivation to Use; USAGE = KMS usage; CDV = Competency Development

t-value = 2.45) all demonstrated significant influence on autonomous motivation to use KMS. Therefore, *H1*, *H3*, and *H4* were supported. The relationship between knowledge content quality and autonomous motivation to use ($\beta = -0.02$, t-value = −0.16) was not significant. Thus *H2* was not supported. The R^2-value for autonomous motivation to use was 0.43 indicating the model explained 43 percent of the variance in autonomous motivation to use.

Additionally, the relationship between autonomous motivation to use ($\beta = 0.75$, t-value = 10.20) and KMS utilization as well as the relationship between autonomous motivation to use ($\beta = 0.20$, t-value = 1.89) and competency development were significant. Therefore, *H5* and *H6* were supported. The relationship between KMS

utilization ($\beta = 0.36$, t-value $= 3.50$) and competency development was significant thus supporting *H7*. The R^2-value for KMS utilization (usage) was 0.72 (72 percent) indicating that a high and substantial amount of the variance in usage was explained by the model. Further, the model explained more than half of the variance in competency development with R^2-value of 0.56 (56 percent). Finally, the added paths indicating relationship between system quality ($\beta = 0.15$, t-value $= 3.08$) and usage as well as relationship between KMS linkage quality ($\beta = 0.28$, t-value $= 4.35$) and competency development were significant.

4. Discussions

This study has extended our understanding of the socio-technical approach to KMS usage in organizations. The empirical results provide sufficient support for the model. All the hypothesized relationships were found to be significant except one. The model provides considerable evidence indicating that in addition to the established KMS technical factors, social factor such as organization tolerance for innovative behavior are important promoter of autonomous motivation towards KMS use; which in turn influences the usage depth of the KM systems. The model explains 72 percent and 56 percent of the variance in KMS usage and competency development arising from KMS usage respectively, indicating an excellent influence of socio-technical factors and user's autonomous motivation in investigating KMS utilization. The 26-item instruments of the study demonstrated an acceptable reliability estimates with results supporting their convergent, discriminant and nomological validity.

The empirical results reveal that both KMS utilization (use) and autonomous motivation to use have positive significant relationship with competency development. KMS use exhibits a greater impact on competency development compared to autonomous motivation to use. Besides, autonomous motivation to use also has a positive significant relationship with KMS use. In other words, if organization employees develop autonomous motivation towards KMS; they will be committed to sustained use of the systems. This indicates that despite its less impact on competency development, development of users' autonomous motivation is a core factor which top management or KM managers must give adequate attention.

Considering the influence of independent variables on autonomous motivation to use, system quality, linkage quality of KMS and innovative norm and practices in organization were found to have demonstrated significant positive influences; but knowledge content quality was not found to be significant. Beyond the dichotomy of extrinsic-intrinsic motivation, researchers have highlighted that both extrinsic and intrinsic motivation may co-exist (Malhotra *et al.*, 2008) to complimentarily influence behavior. Autonomous motivation represents this co-existence, and may encompass user satisfaction and perceived benefits expected of the systems. As this study found positive significant relationships between system quality and autonomous motivation to use, as well as the added path between system quality and KMS use, the results of this study can be said to be more consistent with most previous information system (IS) success studies.

Compared with system quality, linkage quality of KMS shows greater influence on autonomous motivation to use. System usage has become ubiquitous and a requirement for daily operations, therefore users are no longer taking system operations as important issues (Wu and Wang, 2006). Contrary to findings of some

earlier works (Nantapanuwat *et al.*, 2010; Wu and Wang, 2006), knowledge content quality which is a subset of knowledge/information quality was not found to be significant in the model. The significance of linkage quality which is the second half of knowledge quality may be indicating that linkage quality of KMS is the core attribute playing major role in the significant influences of knowledge/information quality found in earlier studies. A likelihood reason for the insignificance of knowledge content quality and the significance of linkage quality on autonomous motivation to use may be attributed to the fact that while linkage quality can easily help employees to connect to knowledge experts or collaborate with colleagues to get jobs or tasks done, knowledge content though may be rich needs to be searched and require frequent update to make it relevant. This also helps to explain the significance influence of the added path between linkage quality and competency development. Linkages to experts and colleagues through KMS allow for fast diffusion of knowledge, which plays major role in improving cognition among individuals and consequently boost their level of competence.

Lastly, and similar to the work of Bock *et al.* (2005), this study found tolerance or value for innovativeness by top management which allows for exploration and exploitation among employees to be of positive significant influence on autonomous motivation to use KMS. Innovative strategy has been found as a significant predictor of knowledge sharing (Hsu, 2008). As innovative norm fosters an environment where individuals feels there is freedom to display competence and creativity, their psychological needs for relatedness, competence and autonomy are likely to be satisfied and consequently motivate them to continue to engage KM tools.

5. Conclusions

Theoretically, a socio-technical framework linking socio-technical antecedents to KMS use and at same time exploring competency development among individuals as impact of KMS use is proposed for an empirical investigation. Probably, this study is the first to have established the link among socio-technical antecedents, autonomous motivation to use, KMS use and development of competency among knowledge workers. This is achieved by building on different theories including the continuum of motivation on system usage explored in (Malhotra *et al.*, 2008). Confirming what is commonly mentioned in literature, our findings empirically unveiled that implementation of KMS is necessary, but not enough condition for its effective utilization. KMS can only be properly utilized when individuals personally appreciate that the use of the technologies has positive roles to play in satisfying their psychological needs.

The findings of this study thus reveal some practical implications for KMS design and for KMS implementation in organizations. The design of KMS as found in most organizations and as mirrored in different previous studies revealed that focus has been on how the systems could be used to populate mainly organizational explicit knowledge and to convert tacit knowledge to explicit form. The findings of this study suggest approaches beyond the current level. An approach that can be proposed is designing of KM systems to allow for organizational socialization mechanisms. This will not only enable diffusion of tacit knowledge across organizations, it will also position KMS as a medium for satisfying psychological needs for relatedness, competency and autonomy. Consequently, a sustained usage of the system is expected. When KM systems enable individuals to share their tacit knowledge directly, the

feeling of authorship recognition among peers will be higher as compared to an indirect approach of having to convert their accumulated knowledge to explicit form to be stored on the systems for others to read. Although organizations need experts knowledge to be codified as an asset for future reference, special incentives may be needed to motivate individuals to contribute to knowledge base. A periodic knowledge accumulation exercise may also help to serve this purpose.

At the organizational level, the study unveils some of the necessary conditions that must be in place for KM systems to be effectively utilized. As linkage quality of KMS was found to be of significant importance, managers or those in charge of KM activities must ensure that processes that facilitate the need for establishing linkages among knowledge workers are in place. The findings of the study highlight the importance of innovative norm or practice as a socio-psychological driver of good knowledge exchange practices across organizations. Thus, organizations may need to audit their job design and fine tune it towards innovative practices prior to or after having implemented KMS. In addition, organizations willing to assess the impacts of their implemented KMS could employ the measures of "competency development" used in this study. It has been mentioned that individuals who use KMS are able to improve their performances. By assessing competency development enabled by KMS, organizational stakeholders would be able to link implemented KMS to their organizational competitive stand.

Although the approach of this study is aimed at generalization of results with the combination of responses from individuals working in different organizational settings, yet there are shortcomings that future result can address. First, this study is limited to a single country; future study can focus on a combination of organizations from different countries so as to confirm the suitability of this study in different cultural settings. Secondly, since the unit of study in this research is at individual level, future study can explore how individual differences such as gender, age and experience level can influence the relationships proposed in this study. In addition, organization characteristics such as firm size and industry type may also be employed as moderators in the proposed relationships. Third, it is important to note that this study focused on KMS technical factors and one organizational factor as predictors of autonomous motivation to use, future studies can also explore other important organizational factors such as collaboration and structure in addition to KMS factors. Fourth, this study focused only on competency development as an individual impact of KMS use, future study can explore more impacts such as knowledge process improvement and organizational innovative capability as other non-financial impacts. Lastly, because autonomous motivation to use is relatively a new construct integrated in this study's framework, future research adopting the model can employ longitudinal research approach to explore the causal effects among the constructs of the model.

References

Al-Busaidi, K., Olfman, L., Ryan, T. and Leroy, G. (2010), "Sharing knowledge to a knowledge management system: examining the motivators and the benefits in an Omani organization", *Journal of Organization Knowledge Management*, available at: www.ibimapublishing.com/journals/JOKM/jokm.html

Alavi, M. and Leidner, D.E. (2001), "Review: knowledge management and knowledge management systems: conceptual foundation and research issues", *MIS Quarterly*, Vol. 25 No. 1, pp. 107-136.

Alavi, M., Kayworth, T. and Leidner, D.E. (2005-2006), "An empirical examination of the influence of organizational culture on knowledge management practices", *Journal of Management Information Systems*, Vol. 22 No. 3, pp. 191-224.

Ali, A.S.B. and Money, W.H. (2005), "A study of project management systems acceptance", *Proceedings of 38th Hawaii International Conference of System Science*.

Anderson, J.C. and Gerbing, D.W. (1988), "Structural equation modeling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, pp. 411-423.

Benbya, H. (2008), *Knowledge Management Systems Implementation: Lessons from the Silicon Valley*, Chandos, Oxford.

Bentler, P.M. (1990), "Comparative fit indexes in structural models", *Psychological Bulletin*, Vol. 107, pp. 238-246.

Bock, G.-W., Zmud, R.W., Kim, Y.–.G. and Lee, J.-N. (2005), "Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate", *MIS Quarterly*, Vol. 29 No. 1, pp. 87-111.

Braganza, A., Hackney, R. and Tanudjojo, S. (2009), "Organizational knowledge transfer through creation, mobilization and diffusion: a case analysis of In Touch within Schlumberger", *Information Systems Journal*, Vol. 19 No. 5, pp. 499-522.

Browne, M.W. and Cudek, R. (1993), "Alternative way of assessing model fit", in Bollen, K.A. and Long, J.S. (Eds), *Testing Structural Equation Models*, Sage, New Park, CA, pp. 445-455.

Ciganek, A.P., Mao, E. and Srite, M. (2008), "Organizational culture for knowledge management systems: a study of corporate users", *International Journal of Knowledge Management*, Vol. 4 No. 1, pp. 1-16.

Deci, E.L. and Ryan, R.M. (1975), *Intrinsic Motivation and Self-determination in Human Behavior*, Plenum Press, New York, NY.

DeLone, W.H. and McLean, E.R. (1992), "Information systems success: the quest for the dependent variable", *Information Systems Research*, Vol. 3 No. 1, pp. 60-95.

DeLone, W.H. and McLean, E.R. (2003), "The Delone and Mclean model of information system success: a ten-year review", *Journal of Management Information System*, Vol. 19 No. 4, pp. 9-30.

Farrell, A.M. and Rudd, J.M. (2009), "Factor analysis and discriminant validity: a brief review of some practical issues", paper presented at the Australian & New Zealand Marketing Academy Conference, available at: www.duplication.net.au/ANZMAC09/papers/ANZMAC2009-389.pdf

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Hair, J.F., Black, W.C., Barbin, B.J., Anderson, R.E. and Tatham, R.L. (2006), *Multivariate Data Analysis*, Prentice Hall, Englewood Cliffs, NJ.

Halawi, L.A., McCarthy, R.V. and Aronson, J.E. (2008), "An empirical investigation of knowledge management systems' success", *Journal of Computer Information Systems*, Vol. 48 No. 2, pp. 121-135.

He, W., Qiao, Q. and Wei, K-K. (2009), "Social relationship and its role in knowledge management systems usage", *Information & Management*, Vol. 46 No. 3, pp. 175-180.

Hong, D., Suh, E. and Koo, C. (2011), "Developing strategies for overcoming barriers to knowledge sharing based on conversational knowledge management: a case study of a financial company", *Expert Systems with Applications*, Vol. 38 No. 12, pp. 14417-14427.

Hsu, I.-C. (2008), "Knowledge sharing practices as a facilitator for improving organization performance through human capital: a preliminary test", *Expert Systems with Applications*, Vol. 35 No. 3, pp. 1316-1326.

Hung, S.-Y., Durcikova, A., Lai, H.-M. and Lin, W.-M. (2011), "The influence of intrinsic and extrinsic motivation on individuals knowledge sharing behavior", *International Journal of Human-Computer Studies*, Vol. 69 No. 6, pp. 415-427.

Huysman, M. and Wulf, V. (2005), "The role of information technology in building and sustaining the relational base of communities", *The Information Society*, Vol. 21 No. 2, pp. 81-89.

Jennex, M.E. and Olfman, L. (2002), "Organizational memory/knowledge effects on productivity: a longitudinal study", *Proceedings of the 35th Annual Hawaii International Conference on System Sciences*.

Jennex, M.E. and Olfman, L. (2003), "A knowledge management success model: an extension of Delone and McLean's IS success model", paper presented at Ninth Americas Conference on Information Systems, AMCIS, Tampa, FL.

Lai, J.–.Y., Wang, C.–.T. and Chou, C.–.Y. (2009), "How knowledge map fit and personalization affect success of KMS in high-tech firms", *Technovation*, Vol. 29 No. 4, pp. 313-324.

Lee, H. and Choi, B. (2003), "Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination", *Journal of Management Information Systems*, Vol. 20 No. 1, pp. 179-228.

Lin, T.-C. and Huang, C.-C. (2008), "Understanding knowledge management system usage antecedents: an integration of social cognitive theory and task technology fit", *Information & Management*, Vol. 45 No. 6, pp. 410-417.

Lopez-Nicolas, C. and Merono-Cerdan, A.L. (2009), "The impact of organization culture on the use of ICT for knowledge management", *Electron Markets*, Vol. 19 No. 4, pp. 211-219.

Maier, R. (2002), *Knowledge Management Systems: Information and Communication Technologies for Knowledge Management*, Springer-Verlag, Berlin.

Malhotra, Y. (2005), "Integrating knowledge management technologies in organizational business processes: getting real time enterprises to deliver real business performance", *Journal of Knowledge Management*, Vol. 9 No. 1, pp. 7-28.

Malhotra, Y. and Galletta, D. (2003), "Role of commitment and motivation as antecedents of knowledge management systems implementation", *Proceedings of the 36th Hawaii International Conference on System Sciences*.

Malhotra, Y., Galletta, D.F. and Kirsch, L.J. (2008), "How endogenous motivations influence user intentions: beyond the dichotomy of extrinsic and intrinsic user motivations", *Journal of Management Information Systems*, Vol. 25 No. 1, pp. 267-299.

Massa, S. and Testa, S. (2009), "A knowledge management approach to organizational competitive advantage: evidence from the food sector", *European Management Journal*, Vol. 27 No. 2, pp. 129-141.

Meyer, J.P., Becker, T.E. and Vandenberghe, C. (2004), "Employee commitment and motivation: a conceptual analysis and integrative model", *Journal of Applied Psychology*, Vol. 89 No. 6, pp. 991-1007.

Nantapanuwat, N., Ractham, P. and Kaewkittipong, L. (2010), "An investigation of determinants of knowledge management systems success in banking industry", *Proceeding of World Academy of Science, Engineering and Technology*, Vol. 71, pp. 588-595.

Nevo, D. and Chan, Y.E. (2007), "A Delphi study of knowledge management systems: scope and requirements", *Information and Management*, Vol. 44 No. 6, pp. 583-597.

Nunnally, J.C. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.

Quaddus, M. and Xu, J. (2005), "Adoption and diffusion of knowledge management systems: field studies of factors and variables", *Knowledge-based Systems*, Vol. 18, pp. 107-115.

Rao, L. and Osei-Bryson, K.M. (2007), "Towards defining dimensions of knowledge systems quality", *Expert Systems with Applications*, Vol. 33 No. 2, pp. 368-378.

Ryan, R.M. and Deci, E.L. (2000), "Self determination theory and the facilitation of intrinsic motivation, social development and well-being", *American Psychologist*, Vol. 55 No. 1, pp. 68-78.

Schein, E.H. (1985), *Organizational Culture and Leadership*, Jossey-Bass, San Francisco, CA.

Sherif, K., Hoffman, J. and Thomas, B. (2006), "Can technology build organizational social capital? The case global IT consulting firm", *Information & Management*, Vol. 43 No. 7, pp. 795-804.

Singh, A.K. and Sharma, V. (2011), "Key attributes of successful knowledge management: an empirical study in telecommunication and software industries", *International Journal of Business Information System*, Vol. 7 No. 1, pp. 78-92.

Strassmann, P. (1997), *The Squandered Computer: Evaluating the Business Alignment of Information Technologies*, Information Economics Press, New Canaan, CT.

Tabrizi, R.S., Foong, Y.P. and Ebrahimi, N. (2011), "The criteria for measuring knowledge management initiatives: a rare glimpse into Malaysian organizations", *Journal of Organizational Knowledge Management*, available at: www.ibimapublishing.com/journals/JOKM/jokm.html

Tong, J. and Mitra, A. (2008), "Knowledge maps and organizations: an overview and interpretation", *International Journal of Business Information System*, Vol. 3 No. 6, pp. 587-608.

Wu, J. and Wang, Y. (2006), "Measuring KMS success: a respecification of the Delone and McLean's Model", *Information & Management*, Vol. 43 No. 6, pp. 728-739.

Zailani, S., Ong, H.K. and Shahnon, S. (2006), "The adoption of information and communication technology (ICT) for effective knowledge management in the small and medium industry in Malaysia", *Asian Journal of Information Technology*, Vol. 5 No. 1, pp. 28-33.

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